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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/941,123	08/28/2001	Gurtej Singh Sandhu	303.676US3	6644

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EXAMINER

MONDT, JOHANNES P

ART UNIT	PAPER NUMBER
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2826

DATE MAILED: 12/18/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/941,123	Applicant(s) SANDHU ET AL.	
	Examiner Johannes P Mondt	Art Unit 2826	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 03 September 2002.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 46,47 and 57-82 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 46,47,57 and 60-82 is/are allowed.
- 6) ☒ Claim(s) 58 and 59 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- | | |
|--------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) <u>5</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Information Disclosure Statement

Supplemental Information Disclosure Statement filed 9/3/2 and entered as Paper No. 5 has been considered.

Response to Amendment

Amendment B filed 3/9/2 and entered as Paper No. 6 forms the basis of the present office action. In Amendment B Applicant substantially amended claims 46, 57, 60, 64, 68, 72, 76, 77, 80 and 81 (and indirectly, claims 47, 58, 59, 61-63, 65-67, 69-71, 73-76, 78-80 and 82, through their dependence on said independent claims). For comments on Remarks by Applicant in said Amendment B see "Response to Arguments" below.

Response to Arguments

1. Through Amendment B Applicant has overcome the objections to claims 68 and 81. Furthermore, the newly added limitation that the titanium silicide layer and the titanium alloy layer must have different composition and must be directly coupled to each other is not taught by the cited art, nor rendered obvious through combination of the teachings of the cited art; nor did an update in the search yield prior art in this regard. Consequently, claims 46-47, 57 and 60-82 are allowed. However, with regard to claims 58 and 59, Applicant's arguments have been fully considered but are not

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persuasive. In particular, with regard to claim 58, Applicant does not traverse the specific reference to column 26, lines 9-11, of the teaching by Xu et al of the formation of a titanium alloy layer of $TiAl_3$. With regard to claim 59, despite the quote from Applicant's disclosure, the prior art as referred to claims in the final structure a titanium silicide layer, not a damaged one. Therefore, the art rejections of claims 58 and 59 have to be maintained at this time.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

1. ***Claims 58-59*** are rejected under 35 U.S.C. 103(a) as being unpatentable over Ikeda et al (5,239,196), in view of Xu et al (6,217,721 B1). Ikeda et al teach a memory device, comprising

a memory array MAY (cf. Figure 2 and column 28, lines 60-62);

a control circuit CC operatively coupled to the memory array MB (said operative coupling is inherent for any control circuit to function) (cf. Figure 2 and column 29, lines 2-3); and

an I/O circuit (cf. Figures 6 and 7), operatively coupled to the memory array (said operative coupling is inherent for any input to get into the memory array or output to be retrieved from it) (cf. column 60, lines 49-59);

wherein at least one of the memory array, control circuit and I/O circuit comprises a contact opening or via or contact having a titanium comprising layer formed in a contact hole and a fill coupled to the titanium comprising layer. Ikeda et al do not necessarily teach said titanium comprising layer to be a titanium alloy layer nor said fill to be formed of aluminum. However, because Xu et al teach that no separate siliciding step is required for inter-level vias provided one chooses to use aluminum for the fill 334 (cf. column 26, lines 27-28), requiring only modest heating to about 400 degrees centigrade (cf. column 26, lines 9-11) it would have been obvious to one of ordinary skills in the art to modify the invention at the time it was made so as to include the abovementioned extraneous limitations. Moreover, as shown by Xu et al it is especially advantageous in the case of high aspect ratio contact holes to fill them with aluminum (cf. column 10, lines 4-18) that subsequently forms a high-conductivity alloy (titanium-aluminum) (cf. column 26, lines 9-11) with the titanium material of a liner of the walls (except the silicided bottom) for the purpose of increasing the electrical conductivity (cf. column 10, lines 10-32) for reduced response time. Because response time is essential to the operational quality of memory devices motivation is established. Because the teaching of Xu et al only would require a different filling of the same contact hole the inventions are combinable. Because the aluminum sputtering process (cf. abstract, line 1) taught by Xu et al is especially designed for present-day high-aspect-ratio devices

and is independent of all other steps in the making of the device as taught by Ikeda et al, success in combining the inventions can be reasonably expected.

With regard to claim 59, the method used for producing the titanium layer is irrelevant to the present device type invention as long as the claimed aspects are found in the final structure of the prior art (*claim 59*).

Allowable Subject Matter

2. ***Claims 46-47, 57 and 60-82*** are allowed: the newly added limitation that the titanium silicide layer and the titanium alloy layer must have different composition and must be directly coupled to each other is not taught by the cited art, nor rendered obvious through combination of the teachings of the cited art; nor did an update in the search yield prior art in this regard.

Conclusion

3. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the

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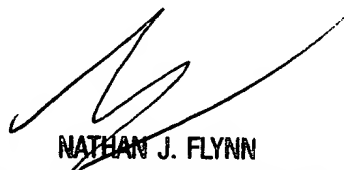
shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Johannes P Mondt whose telephone number is 703-306-0531. The examiner can normally be reached on 8:00 - 18:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nathan J Flynn can be reached on 703-308-6601. The fax phone numbers for the organization where this application or proceeding is assigned are 703-308-7722 for regular communications and 703-308-7724 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

JPM
November 24, 2002



NATHAN J. FLYNN
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800